A Study on Image Retrieval in Social Image Hosting Websites(Digest_要約)

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博士学位論文の要約

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論文の要約

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The websites providing social networking services, such as Flickr, Twitter, Facebook and so on, have been important platforms for people to share information and communicate with others. Social images refer to huge image collections that users share on social networking service websites with additional user generated textual information. Social image hosting websites, such as Flickr, is a kind of social networking service websites that are specially constructed for sharing social images and have rapid growth recently. On these websites, users can upload, tag and share their images; and other users can search and browse these images using these tags. In contrast to keyword annotation in the traditional image retrieval systems, which asks for several experts to annotate the images with some fixed keywords and costs too much time and labor for a large database, these websites allow large amount of users to participate in the tagging tasks. On these websites, a user tags his own images; large number of users tag their images by themselves; therefore the images on these websites are tagged by large number of different users. It is becoming increasingly easy to construct a large database of tagged images. Social tags on images shed a new light on promoting image search for practical application. The research on social image retrieval utilizing tags can be addressed into two dimensions: text-based and content-based. Social tags are naturally effective for text-based social image retrieval. Flickr has provided the service of tag-based image search, and there are also some existing work that can be used for improving text-based social image retrieval. However, to the best of our knowledge, whether and how social tags, which have an open vocabulary and lots of noises, can be used for improving content-based social image retrieval still has not been well investigated in existing work. In this thesis, we focus on this topic and our work are addressed into the following three sub-topics.

1. Unsupervised ranking utilizing social tags for content-based social image

retrieval: The task of this sub-topic is that for a given query image and initial content-based image search results, without any user interaction, this work automatically ranks the images utilizing social tags which are related to these images with an optimized mutual reinforcement process.

2. Supervised re-ranking utilizing social tags with multi modal relevance feedback for content-based social image retrieval: The task of this sub-topic is to boost the performance of content-based image search results with only a few user interactions with a multi modal relevance feedback scheme in which users can select the instances in any modalities, e.g., social images and tags, as positive and negative instances.

3. Improving folksonomy tag quality in social image hosting websites: We do not only improve social image search results by proposing optimized image ranking and re-ranking approaches. We also provide another solution of improving data quality in the social image database by adding new tags and rank the new tags as well as the raw tags for an input social image which can be tagged image or untagged image.

There are two problems in the overall topic of this thesis. One problem is the semantic gap problem between low level visual feature and high level image semantic. To handle this problem, for all these three sub-topics, we construct a unified multi modal relationship graph model to analyze relationships among social images and tags. The original approaches we propose in all these three sub-topics extract and fuse both visual and textual information by propagating these information through the edges of the graph. The other problem is low quality tag problem on the sense of describing image semantic content. We summarize different kinds of low quality tags, and in each sub-topic we solve this problem with different manners.

We conduct computational experiments based on datasets constructed from Flickr and compare our approaches with existing work. The experimental results illustrate the effectiveness and efficiency of our approaches.